Hamilton, Missouri
Water Supply Study
City Lake

Hamilton is located in North Central Caldwell County. Their water supply comes from a city owned lake located approximately 2 miles West of Hamilton. The lake is not large enough, both in drainage area and capacity, to meet the demand during extended periods of dry weather. The drainage area of the lake is 1142 acres (1.78 Sq. Mi.). The city has installed a pump to pump water from Marrowbone Creek to the lake. The drainage area at point of intake is 38.2 square miles. The pump is rated at 1000 gallon per minute and can only pump when flow in the creek is sufficient to allow pumping.

Hamilton currently uses 260,000 gallon of water per day. At the time of this study rural water district #1 was planning obtain their water from Hamilton.

The optimized demand for this lake without pumping from Marrowbone Creek is 190,240 gallon per day.

Hamilton Lake analysis consisted of using the NRCS's computer program called "RESOP". Following is the data and procedures for input to the program.

STO-AREA   Elevation-Storage and Elevation-Area data were determined from
                  July 11, 2000 survey made by USGS.

Hamilton Lake

Elevation (feet)	Area (acres)	Storage (ac-ft)	
901	0.42	0.14	
903	4.37	4.47	
905	10.98	19.35	
907	17.18	46.95	
909	23.41	86.83	
911	29.35	139.49	
913	39.17	207.91	
915	48.36	295.03	
917	61.39	404.06	
919	73.65	539.65	
921	82.09	695.49	
921.6	84.77	745.49	Water Surface on 7/11/2000
923	90.50	868.80	
923.3	91.48	896.09	Spillway Elev.

Spillway Elev. = 923.3 Feet mean sea level - Plans show assumed elev. 113.
Intake Elev. = 917.3 Feet mean sea level - Plans show assumed elev. 107.

LIMITS   Max. Pool storage   896 Ac.Ft.
                  Minimum Pool storage 405 Ac.Ft.

                  This was later changed by a letter from Breck Summerford on 8/9/2000. Lowered to
                  elevation 905.0 feet. This seemed low so it was raised 2 feet to 47 Ac.Ft. storage.

                  Starting storage was considered at maximum pool.

                  The elevation difference between the spillway and intake
                  is only 6 feet. The intake is at elevation of 917.3. The lower
                  limit for the analysis was set at elevation 907.

GENERAL   The adjustment to convert from pan evaporation to lake evaporation was made for the
           control word EVAP. The factor was 0.76. As a result a factor of 100.0 was used here.

           The record period of drought is in the 1950's.
           Analysis began in January 1951 and ended December 1959.

SEEPAGE   The reservoir seepage varied from 0 seepage near empty to a maximum of 1 inch per
           month when at full pool. The material in the dam is compacted earth of clayey soils.
           The lake is shallow so that static pressure is low. As a result seepage is small.

RAINFALL   Rainfall data came from the Gallatin, Mo. rain gage for the period 1951 through May 1954.
           Then records were kept for Hamilton and were used for the period June 1954 through
           1959. Gallatin is located 14 miles north of Hamilton.

RUNOFF   This is the runoff into the lake from its drainage area. Monthly runoff volumes in watershed
           inches were determined at the Jenkins Branch stream gage, a tributary to Platte River.
           The drainage area is 2.72 square miles. Jenkins Br. gage is located approximately 30
           miles WSW from Hamilton. This monthly runoff was compared to the rainfall and if the
           results did not appear reasonable, adjustments were made for that month by looking at
           individual rains and estimating antecedent moisture, then adjusting runoff based on
           NRCS's runoff curve numbers.

EVAP.   Pan evaporation at the Lakeside gaging station was used as a base because it has data
           for year around evaporation. This data was updated with gage data from stations at
           Spickard, New Franklin, and Columbia. Depending on the latest data for the station
           nearest to Hamilton. The adjustment factor of 0.76 to convert from Pan to Lake
           evaporation was applied at this step.

DEMAND   This was determined by city records. Hamilton has a daily use of 180,000 Gallon per Day.
           Also Water district #1 plans to purchase 80,000 GPD of water from Hamilton. The total
           use will be 260,000 gallon per day.

OTHER   This refers to the volume of water pumped from Marrowbone Creek into Hamilton
           Reservoir.

           Determination of the volume of water available for pumping was made using daily
           discharges at the Crooked River stream gage near Richmond. The Crooked River gage is
           about 26 miles South of Hamilton. The drainage area is 159 Square Miles and the
           drainage area at the point of pumping on Marrowbone Creek is 24,455 acres
           (38.2 square miles).

           Daily discharge rates for Crooked River were reduced by a ratio of 38/159 to determine
           potential pumping rates. Pumping was only planned for flows above 2 cubic feet per
           second. This was determined from agreements on Locust Creek. Pumping on Locust
           Creek began at 10 cubic feet per second for 225 square miles drainage area. This is
           10/225=0.044 cubic feet per second per square miles drainage area. 38.2 square miles
           times 0.044 = 1.7 cubic feet per second rounded up to 2 cfs.

           The maximum rate of pumping was 1000 gallon per minute or 2.23 cfs.

           Some months had pumping reduced from the maximum available because the reservoir
           filled and there was flow through the spillway.
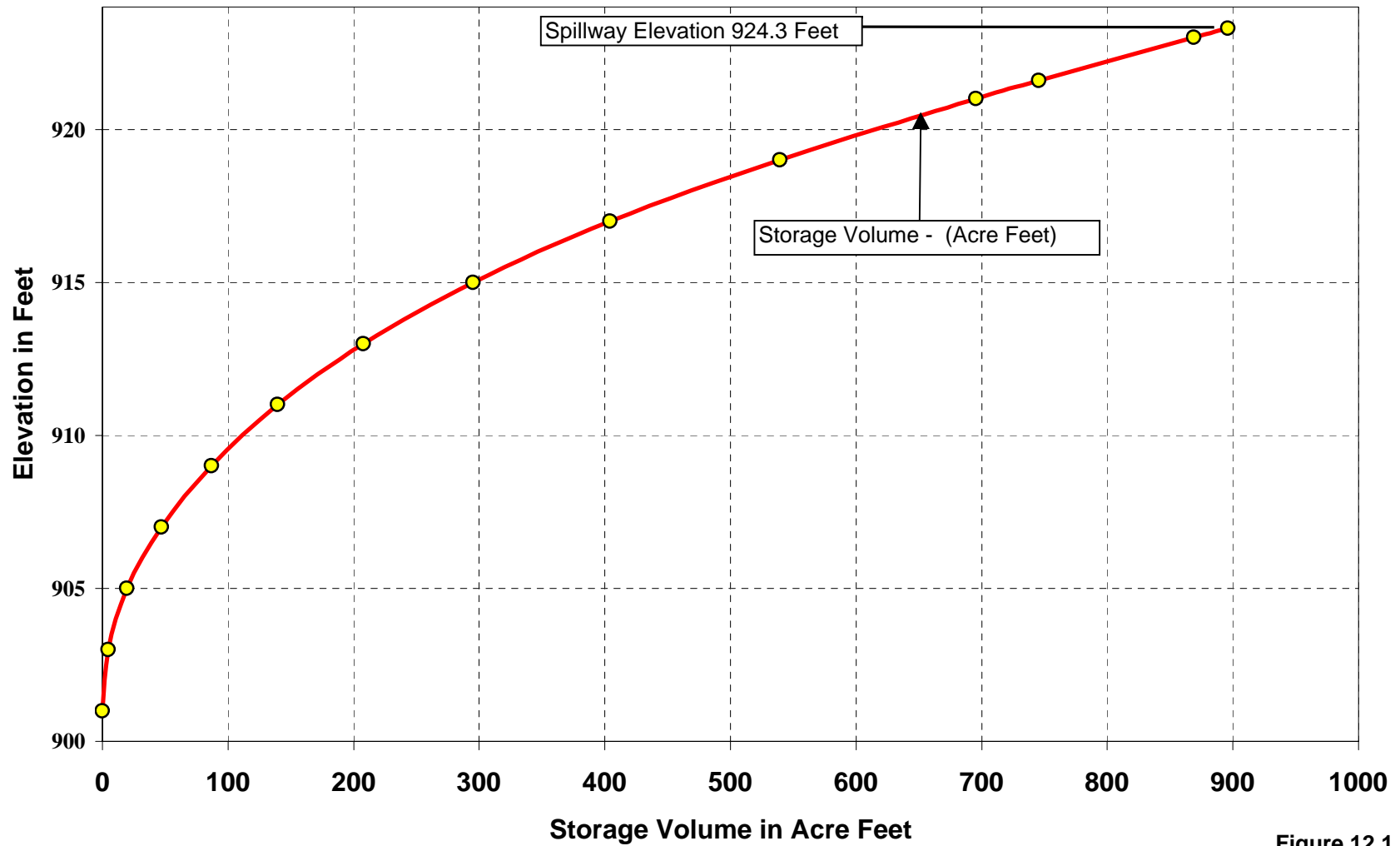
Hamilton, Missouri
Water Supply Study
City Lake
Storage Volume

Spillway Elevation 924.3 Feet

Storage Volume - (Acre Feet)

Elevation in Feet

Storage Volume in Acre Feet

Figure 12.1.a

Hamilton, Missouri
Water Supply Study
City Lake
Surface Area

Spillway Elevation 924.3 Feet

Surface Area - (Acres)

Elevation in Feet

Surface Area in Acres
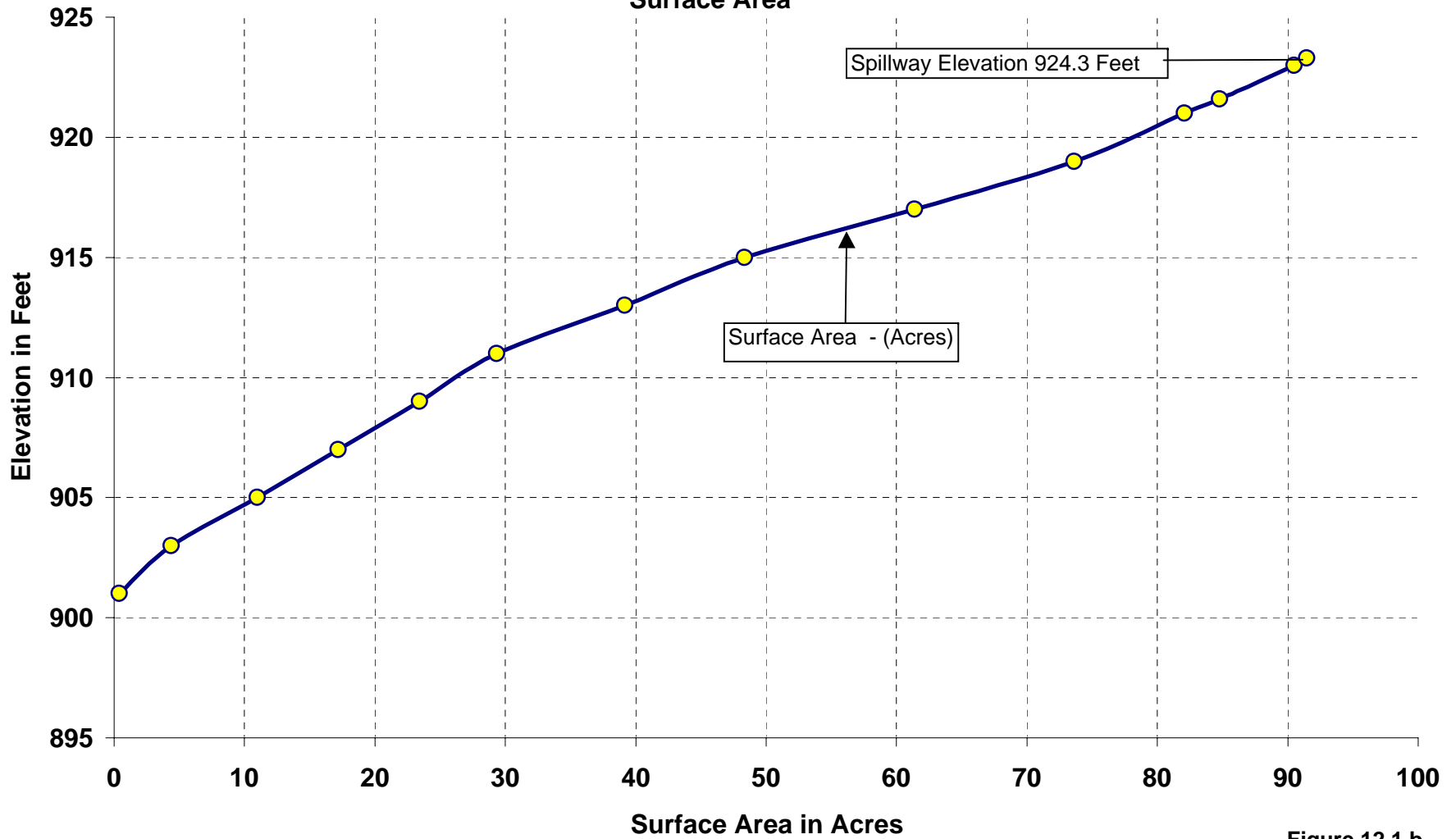
Figure 12.1.b

HAMILTON RESERVOIR
Water Supply Study
City Lake
Lake Storage

Maximum Storage = 896 Acre Feet

Demand = 260,000 GPD,
Pumping 1000 GPM when
enough flow is in Marrowbone
Creek.
Pump when water level is 4 feet

Demand = 260,000 GPD
No Pumping from Marrowbone

Optimized Demand at 190,200
GPD

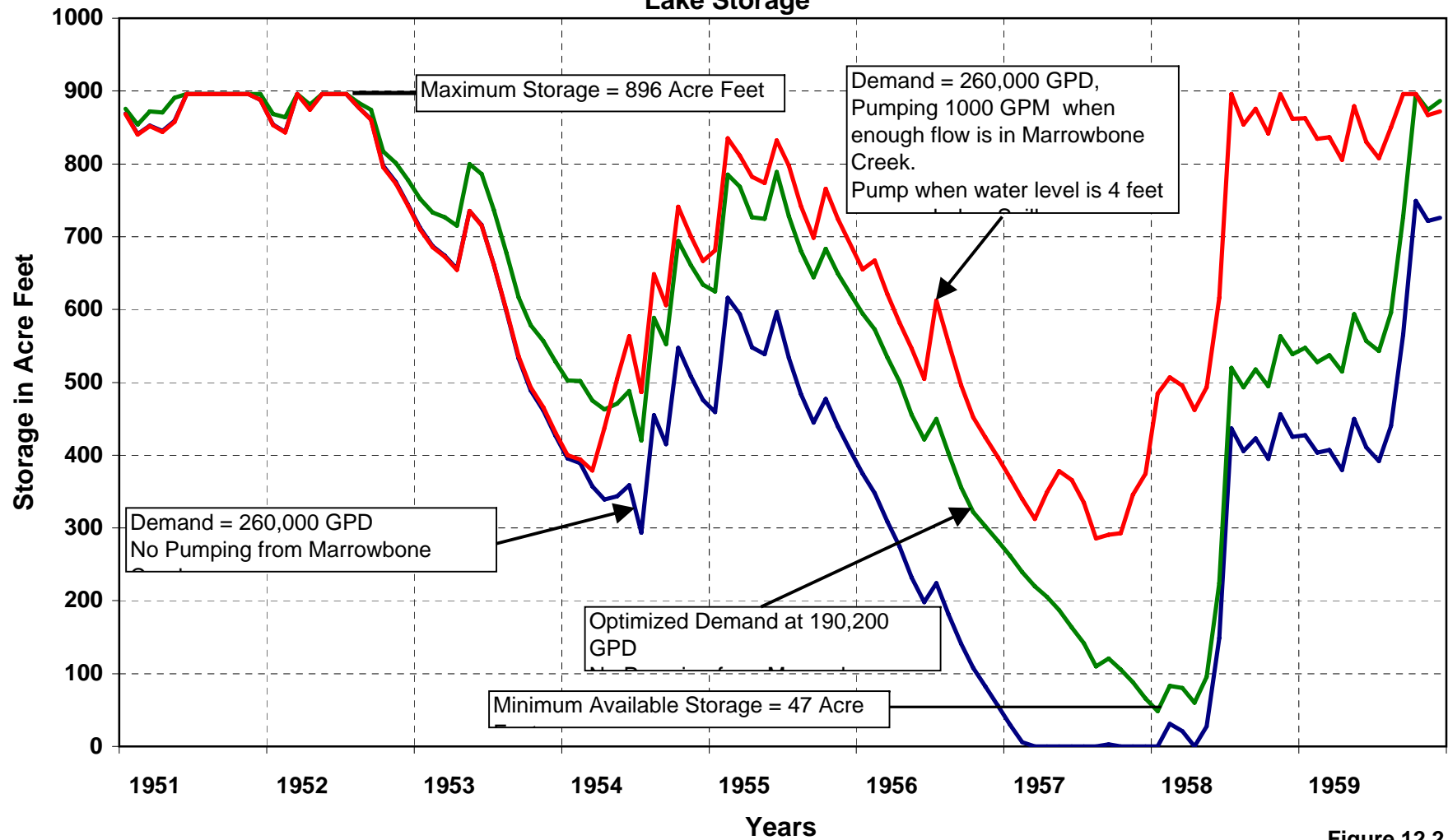Minimum Available Storage = 47 Acre

Storage in Acre Feet

Years

Figure 12.2

Hamilton, Missouri
Water Supply Study
Water Use
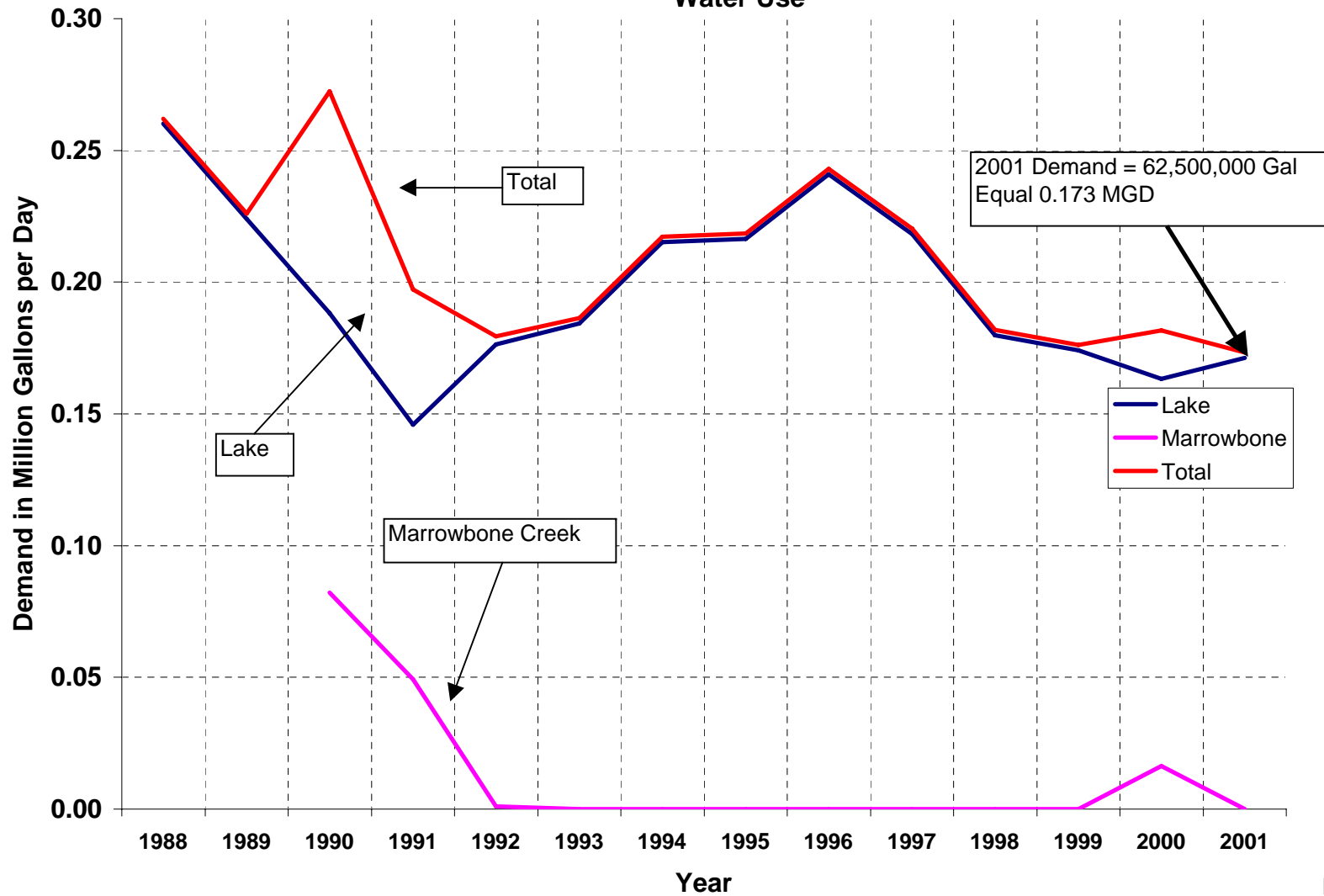
Figure 12.3

HAMILTON LAKE

Elevation (feet)	Area (acres)	Volume (acre-ft)
901.0	0.4	0.1
903.0	4.4	4.5
905.0	11.0	19.3
907.0	17.2	46.9
909.0	23.4	86.8
911.0	29.4	139.5
913.0	39.2	207.9
915.0	48.4	295.0
917.0	61.4	404.1
919.0	73.6	539.6
921.0	82.1	695.5
921.6	84.8	745.5
923.0	90.5	868.8
923.9	93.4	951.6

Table 2. Lake elevations and respective surface areas and volumes. Spillway elevation 923.9 feet. Datum is sea level.

LOCATION MAP

Caldwell County

MISSOURI

0   600   1,200   1,800   FEET

0   200   400   600   METERS
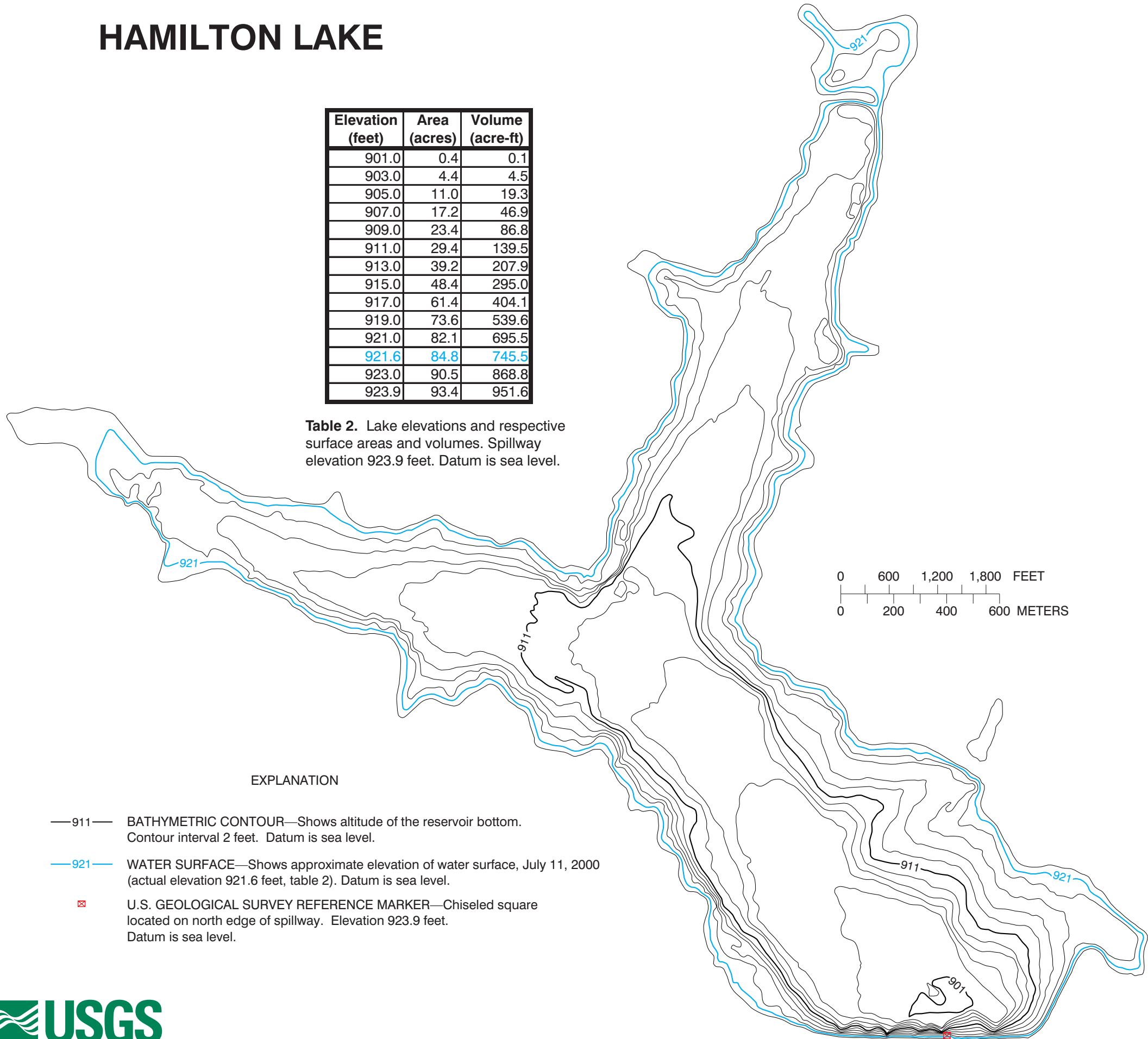
EXPLANATION

——911—— BATHYMETRIC CONTOUR—Shows altitude of the reservoir bottom. Contour interval 2 feet. Datum is sea level.

——921—— WATER SURFACE—Shows approximate elevation of water surface, July 11, 2000 (actual elevation 921.6 feet, table 2). Datum is sea level.

⊠ U.S. GEOLOGICAL SURVEY REFERENCE MARKER—Chiseled square located on north edge of spillway. Elevation 923.9 feet. Datum is sea level.

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Figure 2. Bathymetric map and area/volume table for Hamilton Lake near Hamilton, Missouri.